

*Mechanical Ventilation Heat Recovery Unit*

# **santos (F) 370 DC Standard**



**Operating Instructions**  
**Please keep carefully!**

Status: 11.2012

*Components  
suitable for  
Passive  
House*  
**Dr. Wolfgang Feist**



santos 370 DC

 <sup>®</sup>  
**PAUL**  
**WÄRMERÜCKGEWINNUNG**

Paul Wärmerückgewinnung GmbH  
August-Horch-Straße 7  
08141 Reinsdorf  
Germany  
Tel.: +49(0)375 - 303505 - 0  
Fax: +49(0)375 - 303505 - 55

All rights reserved.

This operating manual has been produced with the greatest care and attention. Nevertheless, the publisher accepts no liability for damage resulting from missing or incorrect information in this operating manual.

# Table of Contents

FOREWORD .....	1
1 INTRODUCTION .....	1
1.1 CE Symbol .....	1
1.2 Guarantee and Liability .....	1
1.2.1 General Information .....	1
1.2.2 Guarantee Terms and Conditions .....	1
1.2.3 Liability .....	1
1.3 Safety .....	2
1.3.1 Safety Regulations .....	2
1.3.2 Safety Provisions and Safety Measures .....	2
1.3.3 Symbols Used .....	2
2 INSTRUCTIONS FOR THE USER .....	3
2.1 Definition of Terms .....	3
2.1.1 Balanced Ventilation (controlled residential ventilation) .....	3
2.1.2 Heat Recovery .....	3
2.1.3 Bypass for Free Cooling .....	3
2.1.4 Frost Protection .....	3
2.1.5 Fireplace Control .....	3
2.1.6 Enthalpy Exchanger .....	3
2.2 Available Operating Aids .....	4
2.2.1 Display on Unit .....	4
2.2.2 3-Position Switch .....	4
2.2.3 Forced Ventilation with Bathroom Switch .....	5
2.3 P Menus for the User .....	5
2.4 Service by the User .....	7
2.4.1 Cleaning or Replacing Filters .....	7
2.4.2 Cleaning Valves (in the home) .....	7
2.5 Malfunctions .....	7
2.5.1 What to Do in the Event of a Malfunction? .....	8
2.6 Disposal .....	8

<b>3. INFORMATION FOR THE INSTALLER.....</b>	<b>9</b>
3.1 Configuring the santos .....	9
3.2 Technical Specifications.....	10
3.3 Dimension Sketch .....	12
3.4 Conditions for Installation .....	13
3.5 Installing the santos .....	13
3.5.1 Transport and Unpacking.....	13
3.5.2 Checking the Scope of Supply .....	13
3.6 Mounting the santos .....	13
3.6.1 Wall mounting .....	13
3.6.2 Connecting the Air Ducts .....	13
3.6.3 Connecting the Condensation Drain .....	14
3.7 Commissioning the santos .....	15
3.7.1 Display on Unit .....	15
3.7.2 P Menus for the Installer .....	17
3.8. Setting Air Specifications .....	19
3.9. Maintenance Information for the Installer .....	20
3.9.1 Inspecting the Heat Exchanger and Fans .....	20
3.10 Malfunctions .....	22
3.10.1 Malfunction Messages Displayed.....	22
3.10.2 Overview of Malfunctions.....	23
3.10.3 Malfunctions (or Problems) not Displayed .....	26

#### Annexes:

Appendix 1 Terminal connection plan santos (F) 370 DC left hand side  
 Appendix 2 Terminal connection plan santos (F) 370 DC right hand side  
 Technical data santos (F) 370 DC  
 Checklist A Maintenance work by the Owner / User  
 Checklist B for qualified personal  
 Air volume protocol  
 Checklist Commissioning and handover  
 CE Declaration of conformity santos 370 DC - Serie

# Foreword

In addition to this general chapter, this operating manual consists of:

- A section for the user,
- A section for the installer.



Please read this operating manual carefully before using the unit.

- User → Chapters 1 and 2.
- Installer → Chapters 1 and 3.

This operating manual contains all the information required to safely and properly install, operate and maintain the santos 370 DC Basic. In addition, it should serve you as a reference manual to enable you to carry out service work safely and responsibly. Due to continuing further development of the unit it is possible that your santos 370 DC Basic may differ slightly from the unit described in this manual.

---

*This manual has been produced with the greatest SFlb care and attention. However, we do not accept legal liability for the contents. Furthermore, the company reserves the right to change the contents of this SFlb operating manual at any time without prior SFlb notification.*

---


## 1 Introduction

*This chapter contains general information on the santos 370 DC Basic.*

### 1.1 CE Symbol

The unit carries the designation santos 370 DC Basic, hereafter referred to as santos.

The santos is a balanced ventilation system with heat recovery functionality that provides healthy, balanced and energy-saving ventilation in residential premises. The santos identification plate is depicted below.

			
Type	Voltage	Hertz	Phase
Product code	Current		
		Power	
	Condensor	Protection class	Insulation class
Serial number			

## 1.2 Guarantee and Liability

### 1.2.1 General Information

The relevant terms and conditions of sales and guarantee for metal, plastic and technical works submitted to the District Court in Den Haag, Netherlands, on 19th October 1998 shall apply.

### 1.2.2 Guarantee Terms and Conditions

The manufacturer guarantees the santos for a period of 24 months following installation or up to a maximum of 30 months following the date of manufacture of the santos. Claims under guarantee can be asserted only for defective material and/or workmanship that become apparent during the period of guarantee. In the event of a guarantee claim, the santos must not be dismantled without the prior written permission of the manufacturer. The manufacturer guarantees spare parts only if these have been replaced and installed by an installer approved by the manufacturer.

***The guarantee will be null and void if:***

- The guarantee period has expired;
- The unit is operated without filters;
- Parts not supplied by the manufacturer are installed;
- Unauthorised changes or modifications are made to the unit.

### 1.2.3 Liability

The santos has been developed and manufactured for use in so-called "balanced ventilation systems". Any other use is considered 'improper use' that can result in damage to the santos or personal injury for which the manufacturer accepts no liability. The manufacturer accepts no liability for damage or injury resulting from the following:

- Failure to observe the safety, operating and maintenance instructions contained in this operating manual;
- Installation of spare parts not supplied or approved by the manufacturer. Responsibility for the use of such spare parts lies solely with the installer;
- Normal wear and tear.

## 1.3 Safety

### 1.3.1 Safety Regulations

Observe the safety regulations given in this operating manual at all times. Failure to observe the safety regulations, warnings, comments and instructions can result in personal injury or damage to the santos.

- Unless clearly stated otherwise in this operating manual, the santos must be installed, connected, commissioned and maintained by an authorised installer only;
- The santos must be installed in compliance with the general building, safety and installation regulations that apply to the place of installation issued by the respective local authority, water and electricity utility and other official regulations and guidelines;
- Observe the safety regulations, warnings, comments and instructions given in this operating manual at all times;
- Keep this operating manual with the santos throughout its service life;
- Closely observe the instructions regarding the regular replacement of filters and cleaning of supply and exhaust air valves;
- The specifications stated in this document must not be altered;
- Do not make any modifications to the santos;
- To ensure that the unit is inspected at regular intervals we recommend that the user concludes a service contract. Your supplier can provide you with the addresses of authorised installers in your vicinity.

### 1.3.2 Safety Provisions and Safety Measures

- The santos cannot be opened without the use of tools.
- It must not be possible to touch the fans with your hand. For that reason air ducts must be connected to the santos. The minimum duct length is 900 mm.

### 1.3.3 Symbols Used

The following symbols are used in this operating manual:



**Caution!**



**Risk of:**

- *Damage to the unit;*
- *Operational reliability of the unit will be adversely affected if the instructions are not correctly observed.*



**Risk of physical injury to the user or the installer.**

## 2 Instructions for the User

*This chapter describes how you should use the santos.*

Congratulations, you are now the owner of a santos 370 DC Basic, a heat recovery unit built by Paul Wärmerückgewinnung GmbH. We wish you every comfort.

### 2.1 Definition of Terms

The santos unit offers the following functions:

- Balanced ventilation;
- Heat recovery;
- Bypass for free cooling;
- Frost protection;
- Chimney sweep control system;
- Enthalpy exchanger (optional).

These terms/properties are described briefly in more detail in the following sections.

#### 2.1.1 Balanced Ventilation (controlled residential ventilation)

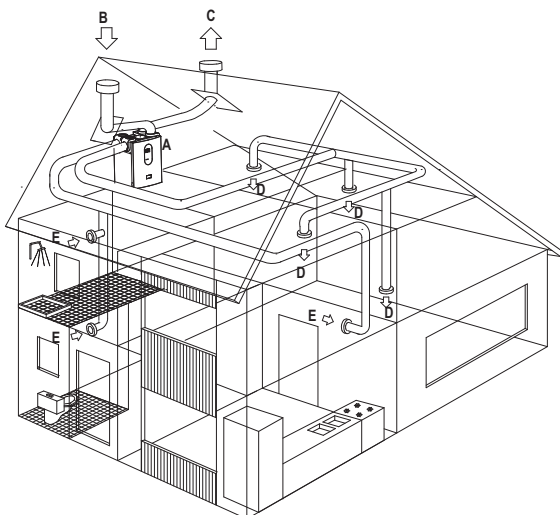
The santos unit has been designed to provide balanced ventilation. Balanced ventilation systems extract stale air contaminated with smells from the kitchen, bathroom, WC(s) and, if necessary, a utility room and introduce an equal volume of fresh air to the living room, bedroom and children's room. A gap below the doors guarantees a good and balanced air circulation in the home.



**Ensure that these gaps are not blocked by, for example, rubber draught excluders or high-pile carpets. This would prevent the system from operating at an optimum.**

A balanced ventilation system generally consists of the following elements:

- santos (A);
- Duct system for the intake of outside air (B) and the discharge of indoor air (C);
- Air supply valves in the living rooms and bedrooms (D);
- Exhaust air valves in the kitchen, bathroom, toilet and, if required, the utility room (E).



#### 2.1.2 Heat Recovery

In addition to a well-balanced ratio between supply and exhaust air volumes the santos unit also offers the benefit of heat recovery. Heat recovery removes the heat from stale exhaust air and transfers it to the fresh, mostly cooler intake air.

#### 2.1.3 Bypass for Free Cooling

The bypass is used most of all on warmer days in the summer months to allow in the cool night air. The bypass functions automatically. All that is required is to set the comfort temperature level.

#### 2.1.4 Frost Protection

The santos is equipped with frost protection. Frost protection is an automatic safeguard function that drastically sinks (or even interrupts) the intake of outside air in the santos when there is a risk of frost. The risk of freezing exists in the winter months with moderate to heavy frost.

#### 2.1.5 Fireplace Control

A suitable safety device or integral system safeguard is required when jointly operating non room-sealed fireplaces and ventilation systems if there is a risk that during operations a dangerous negative pressure can be created in the room in which the fireplace is located.

The santos is equipped with fireplace control; however, this must be activated by the installer.



**Fireplace control does not replace a safety device designed to monitor the difference in pressure; it is a technical precondition for operating the unit when fireplaces are being used at the same time.**



**Once the fireplace control is activated the supply air and exhaust air fans cannot be deactivated manually.**

#### 2.1.6 Enthalpy Exchanger (optional)

The ventilation system can also optionally be equipped with an enthalpy exchanger. An enthalpy exchanger helps to regulate the humidity level in the home. As well as recovering the heat the enthalpy exchanger also recovers the moisture. The moisture from the extracted air is transferred to the intake air being introduced. Moreover, enthalpy exchangers are less susceptible to frost.

## 2.2 Available Operating Aids

The santos can be equipped with the following operating aids:

- Display on unit;
- 3-position switch;
- Bathroom switch (optional) to temporarily set the highest ventilation level.

These operating aids are described briefly in more detail in the following sections.

### 2.2.1 Display on Unit

Settings can be set via the digital display and operating panel on the santos unit.



MENU	Call	up	▲	menu
OK	Up		▼	
🏠	OK		🏠	Down
	Supply air off (LED green)			Exhaust air and supply air on (LED green)
🌡️	Comfort temperature			

A	Display read-out:
1	No ventilation
2	Ventilation level low
3	Ventilation level medium
x x	Ventilation level high
x x	Menu display
.	Malfunction code (flashes)
	Bypass

### Accessing the menus

Se-quence	Operating keys	Display	Description
1	MENU	P2	Time delay values
2	▲	P9	Status display
3	▲	P1	Status display

#### Settings example

Deactivation delay bathroom setting

Se-quence	Operating keys	Display	Description
1	MENU	P2	Time delay values
2	OK	P21	Activation delay value
3	▲	P22	Select 22
4	OK	30	Current setting

5	▼(10 x or hold down)	20	Select 20
6	OK	P22	Current value is 20
7	MENU	P2	
8	MENU	1	Fan steps

👉 **Settings can only be made in the P2 menus. The other P menus (P1 and P9) are read-only menus.**

End (read) menu

- Press "MENU" (instead of "OK").

👉 **The display cannot be used to set the santos ventilation levels. The arrow keys can only be used to set the additional programmes.**

### 2.2.2 3-Position Switch

A 3-position switch is used to set the ventilation levels of the santos. One or more 3-position switches can be installed in a home (for example, in the kitchen).

👉 **When several position switches are installed in the home the santos operates according to the highest ventilation level set, unless a different level is set in the automatic software control.**

### Setting the ventilation level with the 3-position switch

The 3-position switch enables you to set three ventilation levels.

- Position 1 → Low.SFlb- Use for low ventilation requirements.
- Position 2 → Normal.SFlb- Use for normal ventilation requirements.
- Position 3 → High.  
- Use this level when cooking, showering and when high-level ventilation is desired.





### 2.2.3 Forced Ventilation with Bathroom Switch

A bathroom switch can be used to temporarily set the highest ventilation level of the Santos. To allow excess moisture to be discharged as quickly as possible after showering this switch is generally installed in the bathroom. As the bathroom switches can have very different designs, no switch is illustrated here.

If desired, the user may enter activation and deactivation time delays for the bathroom switch via the digital control panel.

#### Activation delay value

Activation delay ensures the Santos does not activate the bathroom switch immediately, but activates the highest ventilation level once the set activation delay time has elapsed.



*If the bathroom switch is deactivated during the set activation delay time the Santos maintains the current ventilation level and the highest ventilation level is not activated.*



*Activation delay is not available to all types of bathroom switches (such as a pulse switch). In this case leave the activation delay time at 0.*

#### Deactivation delay

Deactivation delay ensures the Santos does not deactivate the bathroom switch immediately, but switches back to the normal (or the originally set) ventilation level once the set deactivation delay time has elapsed.



*The deactivation delay function is inactive if the bathroom switch is turned off during the set deactivation time.*

#### Light switch

It is possible to integrate bathroom switch functionality into a light switch.

## 2.3 P Menus for the User

### Menu P1 → Status of function settings

Sub-menu	Description	Status
		Activated
P11	Menu 21 currently active?	Yes (1) / No (0)
P12	Menu 22 currently active?	Yes (1) / No (0)
P13	Menu 23 currently active?	Yes (1) / No (0)
P14	Menu 24 currently active?	Yes (1) / No (0)
P15	Menu 25 currently active?	Yes (1) / No (0)
P16	Menu 26 currently active?	Yes (1) / No (0)

## Menu P2 → Setting time delays

Sub-menu	Description	Time delay values		
		Mini- mum	Maxi- mum	Stand- ard
P20	N/A	0 Min.	180 Min.	0 Min.
P21 (Optional)  Note: Applies only to systems with wired switch and only if your system is equipped with a second switch in the bath- room.	- Low voltage input Activation delay for the bathroom switch (to switch to the highest level). • the santos switches to the HIGHEST LEVEL 'n' minutes after operating the bathroom switch.	0 Min.	15 Min.	0 Min.
P22 (Optional)  Note: Applies only to sys- tems with wired switch and only if your system is equipped with a second switch in the bathroom.	- Low voltage input Deactivation delay for the bathroom switch (to switch to the normal level). • the santos switches to the NORMAL LEVEL 'n' minutes after operating the bathroom switch.	0 Min.	120 Min.	30 Min.
P23 (Optional)  Note: Only for systems with a wired switch.	Deactivation delay for ventilation level 3. • If ventilation level 3 (the highest level) is activated for a short pe- riod (< 3 seconds) the santos will maintain ventilation level 3 for the time set in this menu.  If the position switch is operated during the run-down time the santos immediately switches to the set ven- tilation level.	0 Min.	120 Min.	0 Min.
P24	Filter warning • This option allows the user to determine when the "FILTER DIRTY" warning is displayed.	10 weeks	26 weeks	16 weeks
P25	N/A	1 Min.	20 Min.	10 Min.
P26	N/A	1 Min.	120 Min.	30 Min.
P27	N/A	0 Min.	120 Min.	30 Min.

## Menu P9 → Status of function settings (from menu P5 additional function settings)

Sub-menu	Description	Status
		Activated
P90	Fireplace control active?	Yes (1) / No (0)
P91	Bypass open (=yes) / closed (=no)?	Yes (1) / No (0)
P94	N/A	Yes (1) / No (0)
P95	Frost protection active?	Yes (1) / No (0)
P96	N/A	Yes (1) / No (0)
P97	Enthalpy exchanger active?	Yes (1) / No (0)

## 2.4 Service by the User

As the user you are obliged to service your santos as follows:

- Clean or replace the filters;
- Clean the valves (in the home).

These maintenance procedures are described briefly in more detail in the following sections.

**⚠** *Failure to (regularly) carry out maintenance procedures on the santos will impair the long-term performance of the balanced ventilation system.*

### 2.4.1 Cleaning or Replacing Filters

Clean or replace the filters as soon as the corresponding warning message is displayed on the digital control panel.

**⚠** *Replace the filters (at least) once every six months and clean the filters every 2-3 months.*

"FiL" and "tEr" are indicated alternately on the display.

**👉** *The internal filters are supplied as standard with the santos. The (optional) external filters belong to the ductwork of the ventilation system and are not part of the santos.*

#### *For replacement ...*

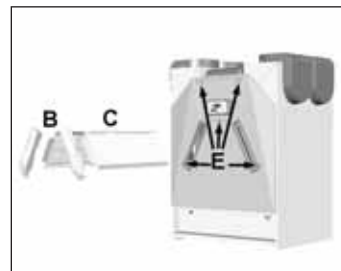
1. Press and hold down the "OK" key for at least 4 seconds until the filter warning indicator goes out.
2. Isolate the unit from the mains power supply.
3. Lift the front panel (A) upwards and remove from the santos unit.



4. Pull the handles (B) of the filter cartridges.



4. Pull the used filters (C) out of the santos.



5. Insert the new filters into the santos.
6. Ensure the handles (B) of the filter cartridges lock into place.
7. Reconnect the unit to the mains power supply.

#### *For cleaning ...*

Instead of replacing the used filters (C) for new ones you can clean the filters (when necessary) using a vacuum cleaner.

**⚠** *Clean the filters (and valves) before using the santos for the first time. The ventilation system may have become soiled with building dust during the building phase.*

### 2.4.2 Cleaning Valves (in the home)

The valves must be cleaned (at least) twice a year.

1. Remove the valve from the wall or ceiling;
2. Clean the valve in a warm soap solution;
3. Rinse the valve thoroughly before drying carefully;
4. Return the valve to EXACTLY THE SAME POSITION (and IN THE SAME HOLE);
5. Repeat this procedure for the other valves.

#### *About valve settings ...*

The installer has set the valves to ensure that the ventilation system provides optimum performance. Therefore, do not change the setting of the valves.

**⚠** *After cleaning, ALWAYS return all valves in exactly the same position (and in the same ventilation holes in the wall or ceiling). Returning them to different positions could impair the performance of the ventilation system.*

The ventilation air is admitted and discharged via valves. Gaps under the doors ensure that the air is able to circulate in the home. To ensure that the right volumes of air are available to the rooms, observe the following:

- Do not block the gaps below the doors;
- Do not alter the setting of the valves;
- Do not swap the valves and their positions.

## 2.5 Malfunctions

If a malfunction occurs, a corresponding malfunction message is displayed. Either an 'A' or 'E' code and a number are always displayed on the display. Please refer to the overview of malfunctions for the meaning of the corresponding code.

### 2.5.1 What to Do in the Event of a Malfunction?

In the event of a malfunction, please contact the installer. Note the malfunction code that is indicated on the display. Please also note your santos model type. This is marked on the identification plate on the top of your santos.

The mains plug must always remain in the plug socket unless the santos has to be shut down due to a serious malfunction, for filter cleaning or replacement or for some other urgent reason.



*The dwelling will no longer be mechanically ventilated as soon as the mains plug is removed from the plug socket. Moisture and mould can occur in the dwelling as a result. Consequently, you should avoid turning off the santos for longer periods of time.*



*DIN 1946-6 specifies that apart from reasons of maintenance and repairs ventilation systems must be operated continually. During periods when the home is not occupied the system should be operated at the lowest ventilation level (level 1 set with 3-position switch, level "Absent" or intermitting holiday programme set via membrane keyboard of operating unit).*



*If the unit is installed in a room with an on average higher level of humidity (for example bathroom or kitchen) it is possible that condensation will form on the outside of the unit. This is a normal phenomenon and does not impair the functional performance of the system.*

## 2.6 Disposal

Discuss with your supplier what you should do with your santos at the end of its service life. If you are unable to return the santos to your supplier, do not simply dispose of it via the household waste; contact your local authorities to find out about possibilities of re-using components or the environmentally safe recycling of the materials.

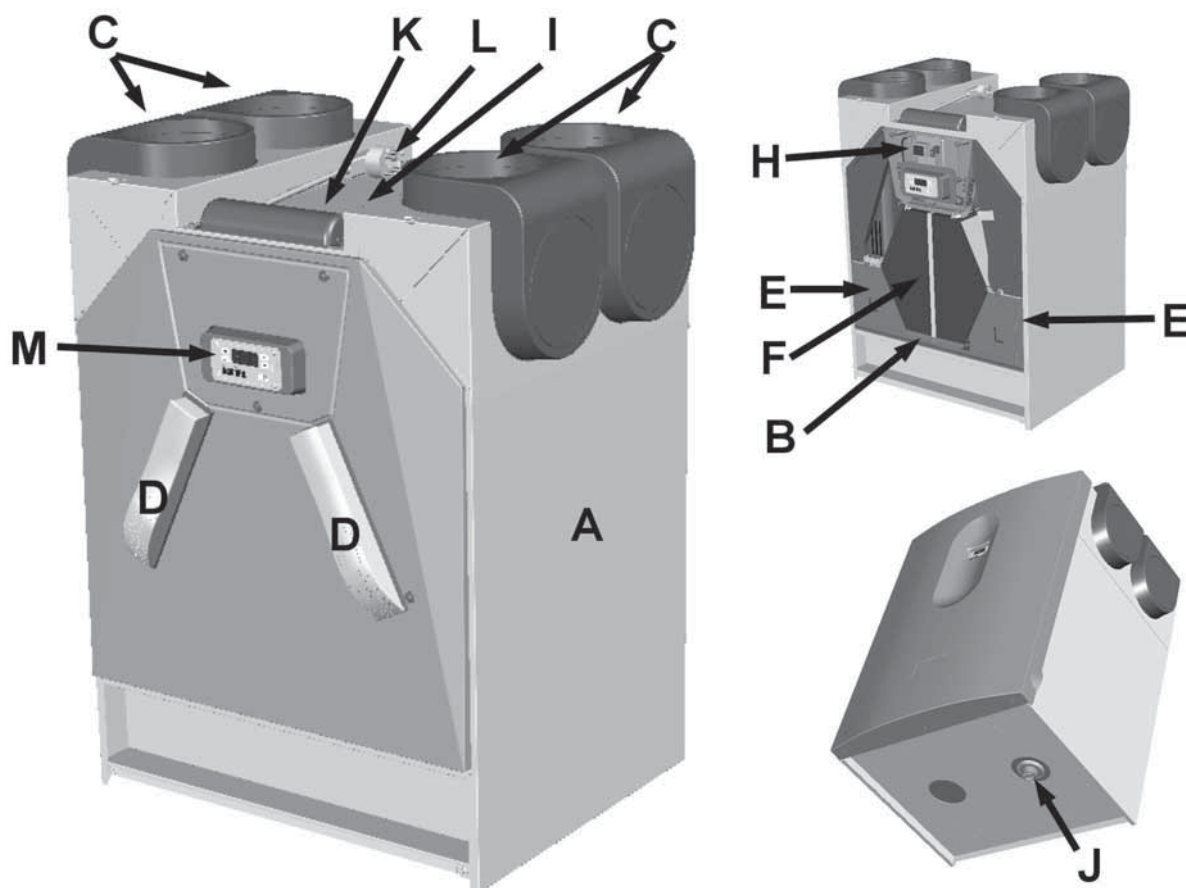
### 3 Instructions for the Installer

*Observe the instructions contained in this chapter when installing the santos.*

#### 3.1 Configuring the santos

The standard version of the santos consists of the following components:

- Outer casing (A) made of coated sheet steel;
- Inner lining (B) made of high-quality expanded polypropylene (E)PP;
- Connections (C) for the air ducts;
- 2 filters (D) for air filtration. Filter rating: Outside air G4, exhaust air G4;
- 2 energy-saving DC motors (E) with high-speed impeller.
- Highly efficient counter flow heat exchanger (F) or membrane moisture heat exchanger (optional);
- Control PCB (H) with connections for the fans, bypass, temperature sensors (T1 to T4), 3-position switch with or without the (optional) malfunction and filter display and the (optional) bathroom switch;
- Identification plate (I) with santos data (not visible);
- Condensation drain (J) for discharging condensation from the warm exhaust air;
- Sticker (K) depicting air connections (not visible);
- 230 VAC connection cable and plug with earthing contact (L);
- Display (M) to view data and make settings.



### 3.2 Technical Specifications

santos 370 DC Basic nL (normal air volume)		
--	--	--

Level	Ventilation rate	Power
LOW LEVEL	120 m <sup>3</sup> /h at 30 Pa	21 W
MEDIUM LEVEL	180 m <sup>3</sup> /h at 65 Pa	44 W
HIGH LEVEL	260 m <sup>3</sup> /h at 140 Pa	105 W
MAXIMUM	350 m <sup>3</sup> /h at 240 Pa	243 W
Level	Ventilation rate	Current
LOW LEVEL	120 m <sup>3</sup> /h at 30 Pa	0.17 A
MEDIUM LEVEL	180 m <sup>3</sup> /h at 65 Pa	0.35 A
HIGH LEVEL	260 m <sup>3</sup> /h at 140 Pa	0.81 A
MAXIMUM	350 m <sup>3</sup> /h at 240 Pa	1.77 A

Power supply	
Supply voltage	230/50 V/Hz
Cos.phi	0.50 - 0.60

Noise level supply air fan (at 0 m)
-------------------------------------

Level	Ventilation rate	Noise level
LOW LEVEL	120 m <sup>3</sup> /h at 30 Pa	50 dB (A)
MEDIUM LEVEL	180 m <sup>3</sup> /h at 65 Pa	59 dB (A)
HIGH LEVEL	260 m <sup>3</sup> /h at 140 Pa	68 dB (A)
MAXIMUM	350 m <sup>3</sup> /h at 240 Pa	75 dB (A)

Noise level exhaust air fan (at 0 m)
--------------------------------------

Level	Ventilation rate	Noise level
LOW LEVEL	120 m <sup>3</sup> /h at 30 Pa	43 dB (A)
MEDIUM LEVEL	180 m <sup>3</sup> /h at 65 Pa	48 dB (A)
HIGH LEVEL	260 m <sup>3</sup> /h at 140 Pa	55 dB (A)
MAXIMUM	350 m <sup>3</sup> /h at 240 Pa	61 dB (A)

santos 370 DC Basic HL (high air volume)
--

Level	Ventilation rate	Power
LOW LEVEL	140 m3/h at 40 Pa	27 W
MEDIUM LEVEL	180 m3/h at 65 Pa	104 W
HIGH LEVEL	325 m3/h at 215 Pa	196 W
MAXIMUM	350 m3/h at 240 Pa	243 W
Level	Ventilation rate	Current
LOW LEVEL	140 m3/h at 40 Pa	0.21 A
MEDIUM LEVEL	180 m3/h at 65 Pa	0.81 A
HIGH LEVEL	325 m3/h at 215 Pa	1.42 A
MAXIMUM	350 m3/h at 240 Pa	1.77 A

Power supply	
Supply voltage	230/50 V/Hz
Cos.phi	0.50 - 0.60

Noise level supply air fan (at 0 m)
-------------------------------------

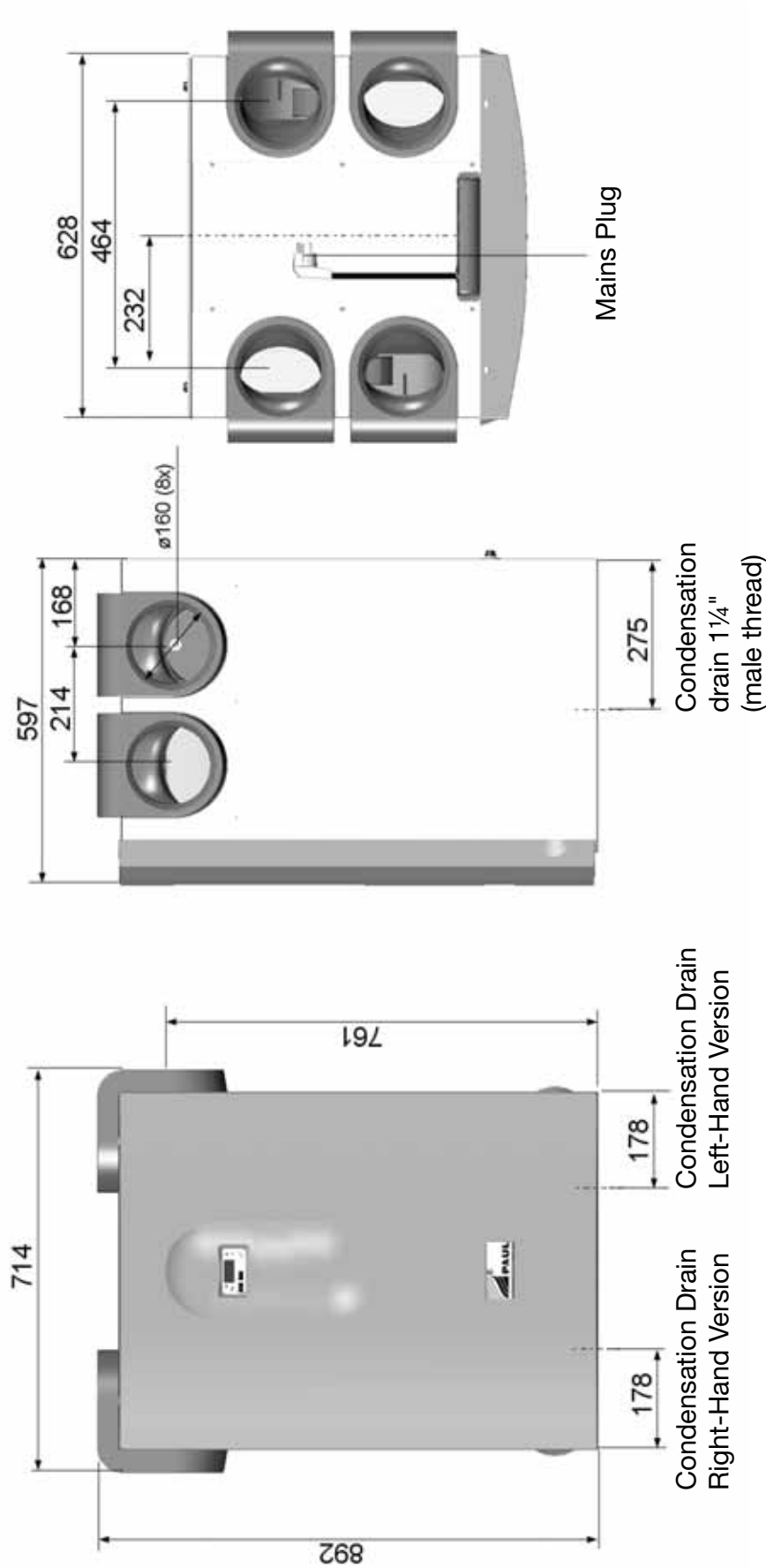
Level	Ventilation rate	Noise level
LOW LEVEL	140 m3/h at 40 Pa	54 dB (A)
MEDIUM LEVEL	180 m3/h at 65 Pa	68 dB (A)
HIGH LEVEL	325 m3/h at 215 Pa	74 dB (A)
MAXIMUM	350 m3/h at 240 Pa	75 dB (A)

Noise level exhaust air fan (at 0 m)
--------------------------------------

Level	Ventilation rate	Noise level
LOW LEVEL	140 m3/h at 40 Pa	45 dB (A)
MEDIUM LEVEL	180 m3/h at 65 Pa	55 dB (A)
HIGH LEVEL	325 m3/h at 215 Pa	59 dB (A)
MAXIMUM	350 m3/h at 240 Pa	61 dB (A)

General specifications	
Material of enthalpy exchanger	Cellulose
Material of counter flow heat exchanger	Polystyrene
Material of inner lining	(E)PP / PA / PC
Heating capacity	95%
Weight	39 kg

3.3 Dimension Sketch







### 3.4 Preconditions for Installation

You must observe the following points to be able to assess whether the santos can be installed in a particular room:

- In addition to observing the instructions contained in this manual you must comply with local safety and installation regulations specified by, amongst others, public utility companies when installing the santos.
- When selecting the place of installation ensure there is sufficient space around the santos for air connections, supply and exhaust air ducts as well as for carrying out maintenance work.
- The following installations must be available in the room:
  - Air duct connections.
  - 230 V mains power supply.
  - Connection for the condensation drain.
- Install the santos in a frost-protected room. Ensure the condensation water is discharged frost-free with a downward gradient and using a siphon.


 *We recommend you do not install the unit in a room with an on average higher level of humidity.*

 *To ensure a good and draught-free ventilation of the dwelling, 10 mm gaps must be left purposely under the doors inside the dwelling. If these gaps are blocked, for example with door seals or high-pile carpets, the circulation of air inside the dwelling will stagnate. This would prevent the system from operating optimally.*

### 3.5 Installing the santos

#### 3.5.1 Transport and Unpacking

Work with due care and attention when transporting and unpacking the santos.

 *Remove the unit from the packaging only immediately prior to mounting the unit.*

 *To protect against the ingress of*

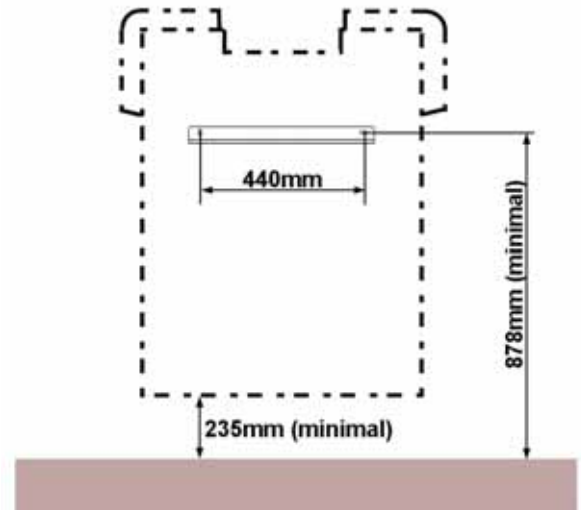
#### 3.5.2 Checking the Scope of Supply

Should you discover any damage or missing parts of the supply product, please contact your supplier without delay. The scope of supply includes:

- Santos 370 DC Basic;  
Check the identification plate to ensure it is the correct type.
- Mounting brackets;
- Operating Manual

### 3.6 Mounting the santos

#### 3.6.1 Wall mounting



Mount the santos on a wall with a mass of at least 200 kg/m<sup>2</sup>.

With other walls we recommend the use of a mounting frame to install on the floor (optional). This helps to avoid the transmission of structure-borne noise as much as possible.

- Fasten the supplied mounting bracket to the wall horizontally.
- Connect the condensation drain (not included in the scope of supply) to the underside of the santos. The given dimension of 235 mm is intended as a guideline. This value depends on the type of siphon selected.
- Ensure that at least 1 metre of space is left in front of the santos to allow future maintenance work.

#### 3.6.2 Connecting the Air Ducts

Observe the following specifications when fitting air ducts:

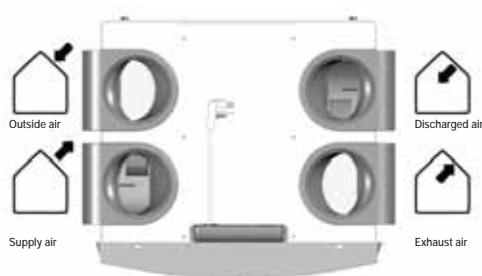
- Install silencers of at least 1 meter in length to the supply and exhaust air connections of the unit. For relevant advice, please contact Paul Wärmerückgewinnung GmbH.
- Fit the air ducts to be connected (minimum  $\varnothing 160$  mm), ensuring they are sealed airtight and offer as little resistance to the flow of air as possible.
- To guarantee the basic functionality of the balanced ventilation system when utilising flexible ducting, use only air ducting material from Paul Wärmerückgewinnung GmbH.
- Ensure the insulation of the intake air and discharge air ductwork is vapour tight. This prevents the formation of condensation on the outside of the ducts.
- If it is not possible to avoid creating a low point when installing the discharge air ducting from the discharge air connections on the unit to the wall opening, then a further condensate

drainage line must be connected at the low point; the reason being discharged air is saturated with water vapour when confronted with cold outside temperatures and that causes droplets to deposit on the inside of the ductwork.

- If it is planned to install a silencer at the discharge air connection, then this must be routed upwards by a bend to protect it against being soaked by condensation flowing back out of the discharge air ductwork. When mounting the unit ensure the condensate can be drained with a good downward gradient along a longer distance.
- When routed across a roof the exhaust air duct must have a double-walled or insulated roof opening. This prevents the formation of condensation between the layers of the roof.
- To prevent unnecessary temperature losses in both summer and winter we recommend you insulate the supply and exhaust air ductwork with thermal, vapour-tight insulation.



santos - LEFT



santos - RIGHT

### 3.6.3 Connecting the condensation drain



santos 370 DC - RIGHT




santos 370 DC - LEFT


The warm exhaust air is cooled by the intake air in the heat exchanger. As a result, moisture contained in the inside air condenses in the heat exchanger. The condensation water that forms in the heat exchanger is directed towards the siphon.


The connection for the condensation drain has an outside diameter of 32 mm. This is located on the underside of the santos.

- Connect the condensation drain with a pipe or hose to the water seal of the domestic wastewater system.

- Position the upper edge of the water seal at least 40 mm below the condensation drain of the santos unit.
- Ensure that the end of the pipe or hose ends below the water level.

 **Ensure that the water seal connected to the domestic wastewater system is always filled with water.**

 **Ensure that the hose end terminates at least 60 mm below the water level. This will prevent the santos from drawing in air.**

 **Do not connect the condensate drain directly to the sewage drain system (for example flowing freely into funnel with condensation drain at the sewage system)**


### 3.7 Commissioning the santos

The santos can be put into operation after installation.

Commissioning can be carried out via the P menus on the unit display. These P menus allow various settings (in particular for ventilation control) to be selected for the santos. An overview of the available P menus is given below:








Menu	Possibilities
P1	View status (from menu P2)
P2	Set time delay values
P3	Set ventilation levels
P4	View temperatures
P5	Set additional control functions
P6	Set additional control functions
P7	Read and reset malfunctions (and system information)
P8	Set 0 - 10 V inputs
P9	View status (from menu P5)

The P menus P1, P2 and P9 are user accessible and serve mainly for viewing statuses and setting time delays. The remaining P menus P3 to P8 are reserved exclusively for the installer.








 **The bypass valve will not move in the first 4 minutes following a drop in voltage, if the setting mode is not activated.**

#### 3.7.1 Display on Unit



	Call up menu		Up
	OK		Down
	Supply air off supply air on (LED green)		Exhaust air and (LED green)
	Comfort temperature		

Display read-out:

	Ventilation level absent
	Ventilation level low
	Ventilation level medium
	Ventilation level high
	Menu display
	Malfunction code (flashes)
	Bypass


#### Accessing the menus

Se-quence	Operating keys	Display	Description
1	MENU	P2	Time delay values
2	▲ + ▼ (3 seconds)	P3	Press keys simultaneously
3	▲	P4	Temperatures
4	▲	P5	Control settings
5	▲	P6	Control settings
6	▲	P7	Malfunction / reset / Self-test
7	▲	P8	0 - 10 V inputs
8	▲	P9	Status display

#### Settings example


Set the power of the supply air fan at THE MEDIUM LEVEL to 40%

Se-quence	Operating keys	Display	Description
1	MENU	P2	Time delay values
2	▲ + ▼ (3 seconds)	P3	Press keys simultaneously
3	OK	P30	Exhaust air fan Level A
4	▲ (6x)	P36	Select P36
5	OK	50	Current setting
6	▼ (10 x or hold down)	40	Select 40
7	OK	P35	Current value is 40
8	MENU	P3	
9	MENU	1	Fan steps

 **Some P menus (for example P1 and P9) are view only.**

End (read) menu

- Press "MENU" (instead of "OK").

 **The display cannot be used to set the santos ventilation levels. The arrow keys can only be used to set the additional programmes.**

### Menu P3 → Set ventilation controls

Sub-menu	Description	Values for ventilation controls		
		Minimum	Maximum	Standard
P30	N/A	0% or 15%	97%	Normal / High 15% / 15%
P31	The power (in %) of the exhaust air fan FOR THE LEVEL "LOW".	16%	98%	Normal / High 35% / 40%
P32	The power (in %) of the exhaust air fan FOR THE LEVEL "MEDIUM".	17%	99%	Normal / High 50% / 70%
P33	The power (in %) of the exhaust air fan FOR THE LEVEL "HIGH".	18%	100%	Normal / High 70% / 90%
P34	N/A	0% or 15%	97%	Normal / High 15% / 15%
P35	The power (in %) of the supply air fan FOR THE LEVEL "LOW".	16%	98%	Normal / High 35% / 40%
P36	The power (in %) of the supply air fan FOR THE LEVEL "MEDIUM".	17%	99%	Normal / High 50% / 70%
P37	The power (in %) of the supplyf air fan FOR THE LEVEL "HIGH".	18%	100%	Normal / High 70% / 90%
P38	Current power (in %) of the exhaust air fan.	-	-	Current %
P39	Current power (in %) of the supply air fan.	-	-	Current %

### Menu P4 → View temperatures

Sub-menu	Description	Temperature values		
		Minimum	Maximum	Standard
P41	Comfort temperature	12 °C	28 °C	20 °C
P45	Current value of T1 (= temperature of outside air)	-	-	Current °C
P46	Current value of T2 (= temperature of supply air)	-	-	Current °C
P47	Current value of T3 (= temperature of exhaust air)	-	-	Current °C
P48	Current value of T4 (= temperature of discharged air)	-	-	Current °C

## 3.7.2 P Menus for the Installer



### *Menu P5 → Setting additional control functions*

Sub-menu	Description	Values for additional control functions		
		Minimum	Maximum	Standard
P50	Activating the fireplace control.	0 (= No)	1 (= Yes)	0
P51	n/a	0 (= No)	1 (= Yes)	0
P52	n/a	0	3	2
P54	Indicate presence of a bypass	0 (= No)	1 (= Yes)	1
	<b>Note:</b> The santos is fitted with a bypass valve as standard equipment. Therefore, the value can be left at '1'.			
P56	Setting the requisite volume of air for the dwelling. • nL: "Normal air volume". • HL: "High air volume".	nL	HL	HL
	<b>Note:</b> The setting undertaken in P56 for the air volume ("nL" or "HL") forms the basis for setting the air specifications and hence for setting the fans.			
P57	Santos setting. • Li = "Left-hand version" • Re = "Right-hand version".	Li	Re	Li
	<b>Note:</b> The santos unit is correctly set ex works. • Refer also to the identification plate for this data.			
P58	Enter the priority for the control setting. • 0; Priority for high level INCLUDING analogue input. • 1; Priority for high level EXCLUDING analogue input.	0	1	0
P59	Indicate the presence of the enthalpy exchanger. • 0; No enthalpy exchanger installed • 1; Enthalpy exchanger with RH sensor installed • 2; Enthalpy exchanger without RH sensor installed	0 (= No)	2 (= Yes)	0
	<b>Note:</b> It is not possible to connect an RH sensor to the santos unit. Consequently, select Option 2, if an enthalpy exchanger is installed.			

### *Menu P6 → Setting additional control functions*

Sub-menu	Description	Values for additional control functions		
		Minimum	Maximum	Standard
P60	N/A	0 (= No)	3 (= Yes)	0
	<b>Note:</b> Keep this setting to standard.			

## Menu P7 → View and reset malfunctions (and system information)

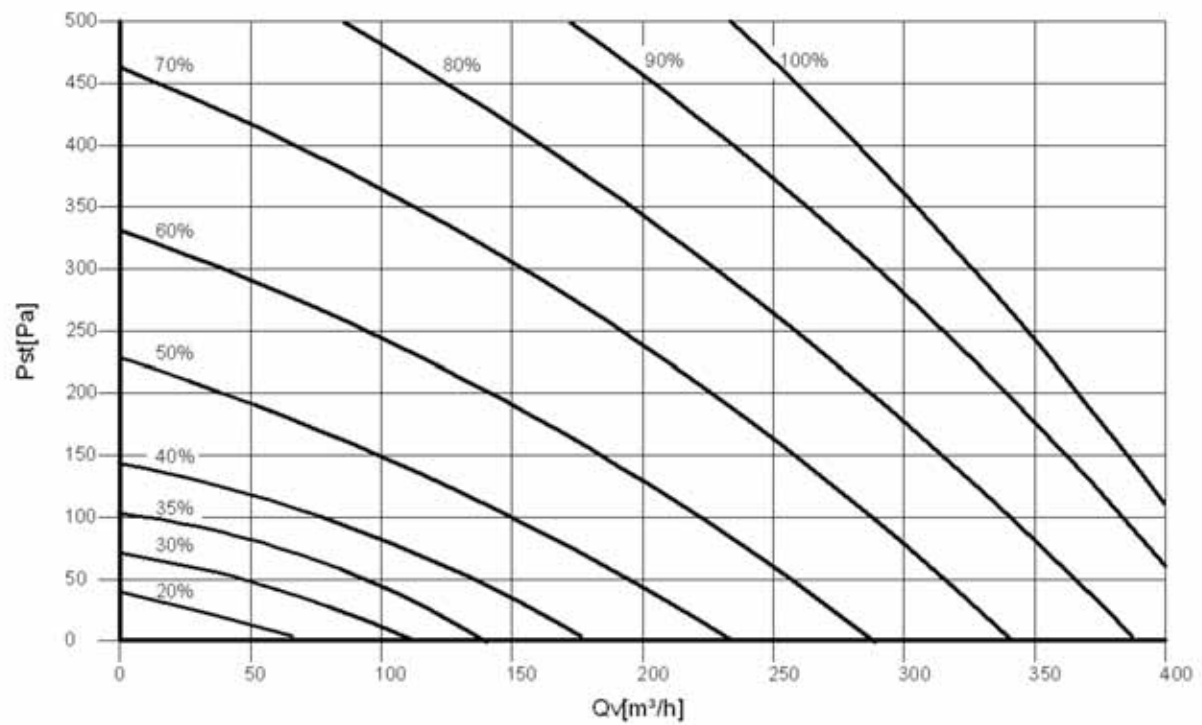
Sub-menu	Description	Values (malfunction) information		
		Minimum	Maximum	Standard
P70	Current software version	Software version number (without "v")		
P71	Last malfunction.	Code compliant alarm and malfunction messages		
P72	Last malfunction but one	Code compliant alarm and malfunction messages		
P73	Last malfunction but two	Code compliant alarm and malfunction messages		
P74	Reset a malfunction on the santos	0	1	0
P75	Restore factory settings	0	1	0
	<ul style="list-style-type: none"> <li>Press and hold down the "OK" key on the digital control panel to restore factory settings. This action will restore the original factory settings.</li> </ul> <p>Note:</p> <p> After a complete reset, the santos prompts you to re-enter "nL / HL" (see P56) and "Li / Re" (see P57) selection.</p> <p> After a complete reset, all settings in menus P2 and P3 and the existing controls P5 and P6 have to be set again.</p>			
P76	Santos self-test	0	1	0
	<p>Note:</p> <p>The santos switches to the highest level immediately after the self-test is activated. In addition, the bypass valve also opens and closes immediately after the self-test is activated.</p>			
P77	Reset counter filter soiled	0	1	0
	<p>Note:</p> <p>This control command resets the counter that the filter warning indicator evokes. This allows the filter to be cleaned or replaced before the filter warning is indicated.</p>			

## Menu P8 → Analogue control settings

Sub-menu	Description	Values (malfunction) information		
		Minimum	Maximum	Standard
850	N/A	0	1	0
851	N/A	0	1	0
852	N/A	0	100	50
853	N/A	0	99	0
854	N/A	0	100	100
855	N/A	0	1	0
856	N/A	0	100	-

### 3.8 Setting the Air Specifications

Settings must be made to the santos unit following installation.



These can be undertaken using the air specifications of the santos shown above.





The standard settings for the santos, nL, are as follows:


Level LOW	35%
Level MEDIUM	50%
Level HIGH	70%

The standard settings for the santos, HL, are as follows:


Level LOW	40%
Level MEDIUM	70%
Level HIGH	90%

To set the santos (following installation) proceed as follows:

1. Set the santos to the programming mode.
  - Display: Simultaneously press the keys "  " and "  " for at least 3 seconds until "InR" is displayed.

 **When in the setting mode the damper of the bypass valve are always closed. The santos automatically switches off the setting mode after 30 minutes.**

2. Close all windows and outside doors.
3. Then close all inside doors.
4. Check the presence of air circulation systems in the building (at least 12 cm<sup>2</sup> per l/s).


 **The air circulation systems in the building must achieve at least 12 cm<sup>2</sup> per l/s.**

5. Check, if both fans function in the three speed ranges.
6. Set the santos to high speed.
7. Install all the valves and set them as detailed in the instructions or as in the reference dwelling.

If no data is known:



- Install the valves and open them as far as possible.
- Measure the air volumes, first the supply air and then the exhaust air.
- If the measured air volumes differ from the nominal air volumes by more than approx. 10%, and if the majority of the deviations are in the plus range, adjust the fan so that all the deviations are in the plus range. If the majority of the deviations are in the minus range, adapt all the deviations so that they are all in the minus range. Ensure also that a supply and an exhaust valve remain fully open.

8. Alter the fan settings in the P menus P30 and P37 via the display.
  - Select the lowest possible setting to minimise energy consumption.
  - Ensure that the ratio of air volumes between high, medium and low remains the same.

 **Refer to the santos air specification diagram when setting the fans.**

9. Should the air volumes set to date still differ too

much:

- Adjust the valves further.
10. Check the whole system again after adjusting all of the valve levels.
  11. Switch on the santos unit (again) and set it to ventilation level 2.
    - Display: Simultaneously press the keys "  " and "  " for at least 3 seconds until "InR" is no longer displayed.

### 3.9 Service by the Installer

As the installer you are obliged to service your santos as follows:

- Inspect the heat exchangers and fans. These maintenance procedures are described briefly in more detail in the following sections.



**Failure to (regularly) carry out maintenance procedures on the santos will impair the long-term performance of the balanced ventilation system.**

#### 3.9.1 Inspecting the Heat Exchanger and Fans

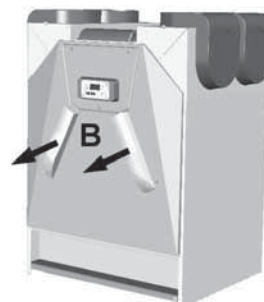


**Check the condensation drain, the fans and the heat exchanger every 2 years.**

1. Isolate the unit from the mains power supply
2. Lift the front panel (A) upwards and remove from the santos unit.

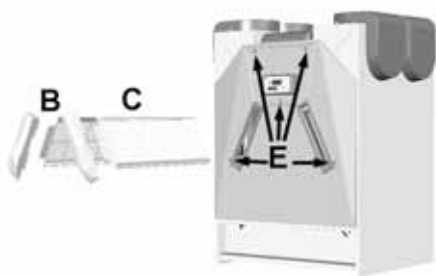


3. Pull the handles (B) away from the santos.



4. Remove the filters (C) from the santos.
5. Remove the sealing plate by removing the screws (E).





**When installing the sealing plate, its underside must first be inserted behind the raised edge to ensure a good seal is achieved.**

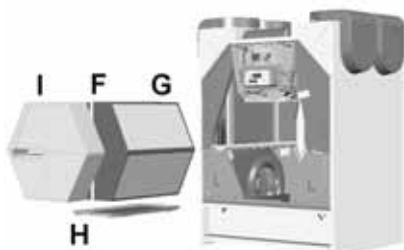
### **santos – Left-hand version**

6. Pull the strap (F) to remove the heat exchanger (G) and the drain plate (H).
7. Remove the bypass duct (I) from the left-hand version of the santos.



### **santos – Right-hand version**

6. Remove the bypass duct (I) from the right-hand version of the santos.
7. Pull the strap (F) to remove the heat exchanger (G) and the drain plate (H).



8. Remove the heat exchanger (G) from the drain plate (H).

**There may still be water in the heat exchanger!**

9. Clean the heat exchanger, if necessary.
  - To clean immerse the heat exchanger in warm water (max. 40 °C).
  - Rinse the heat exchanger thoroughly with warm tap water (max. 40° C).
  - Hold the heat exchanger with both hands on

the coloured side surfaces and shake out all the water.

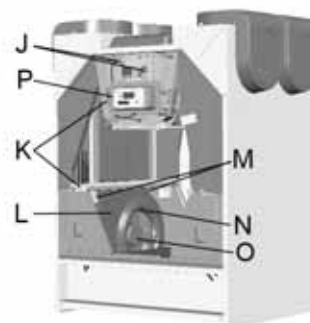
Cleaning the enthalpy exchanger:

- Follow the instructions for cleaning displayed on the frontside of the enthalpy exchanger.

**Do not use aggressive or solvent-based cleaning agents.**

**Do not install the heat exchanger yet; proceed as follows to remove, inspect and, if necessary, clean the fans.**

10. Remove the plastic panel (I) located in front of the PCB by loosening the two screws.
11. Disconnect the connectors (J) and the earth wire from the PCB, and completely remove the cables as well as both grommets (K).
12. Remove the complete volute fan casing (L) by pressing in the click-fasteners (M).
13. Remove the inlet cone (N) by pressing in the click-fasteners around the volute fan casing.
14. Clean the fans (O).



**Use a soft brush to clean the fan impellers.**

**Remove dust using a vacuum cleaner.**

**Take care not to damage the fan impellers.**

**Take care not to damage the temperature sensor.**

15. Install all the parts again in the reverse order.
16. Reconnect the unit to the mains power supply.
17. Initiate the self-test in line with menu P76.

**Refit the drain plate (H) again correctly below the heat exchanger. The holes in the drain plate must be on the side of the condensation drain.**

**Tighten the screws to a maximum torque of 1.5 Nm. This corresponds roughly to level 2 of a normal cordless drill.**

### 3.10 Malfunctions

In the event of a malfunction in the santos a warning message is generally displayed on the display of the digital control panel.

However, not all malfunction messages are displayed on the display of the digital control panel, even if there is a malfunction (or problem). Both types of malfunction (or problem) are described briefly in the following sections.

#### 3.10.1 Malfunction messages displayed

Below is an overview of the malfunction messages that are shown on the display of the digital control panel.

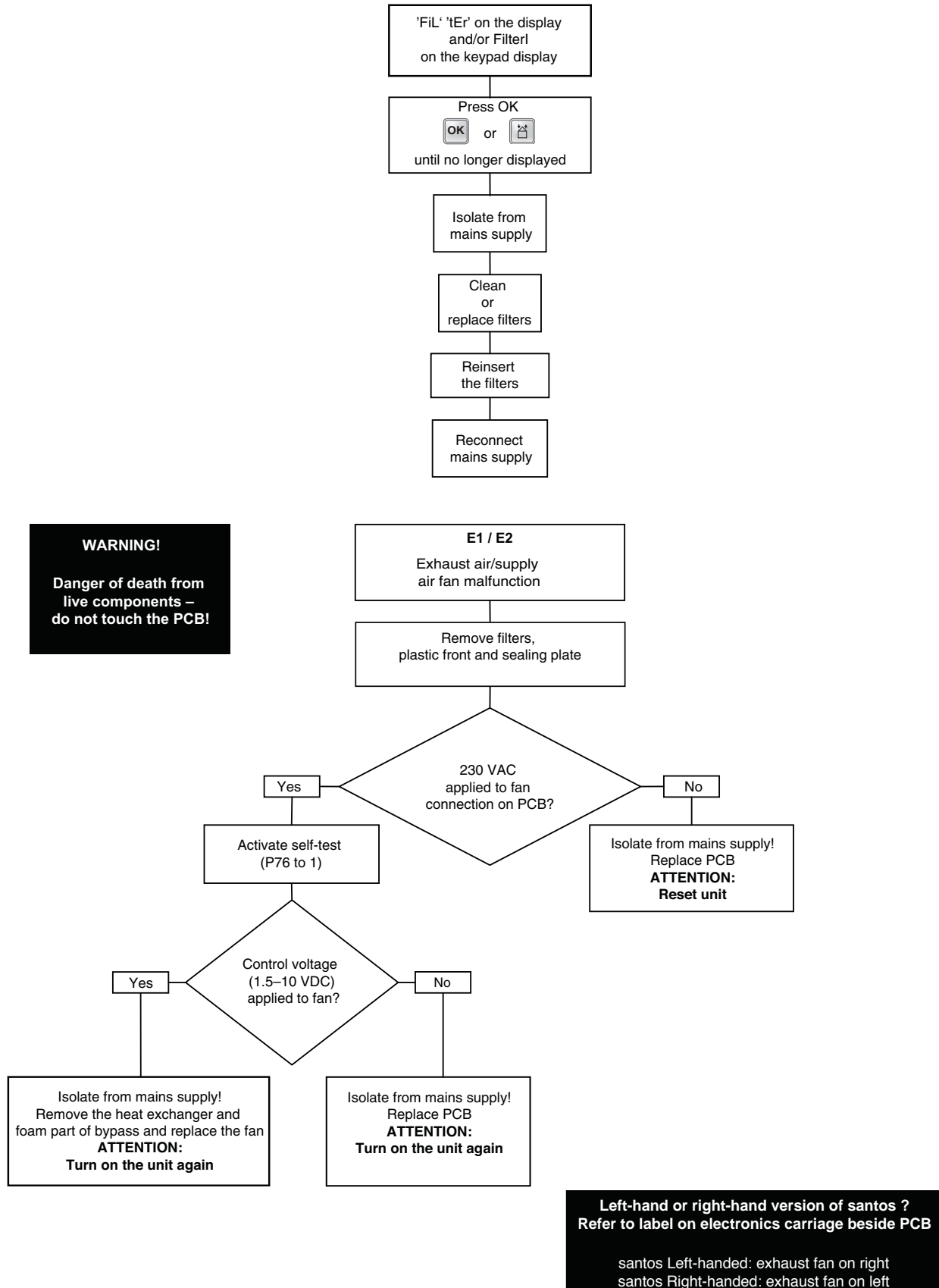
Code	Description
A1	NTC sensor T1 defective. (= temperature of outside air)
A2	NTC sensor T2 defective. (= temperature of supply air)
A3	NTC sensor T3 defective. (= temperature of exhaust air)
A4	NTC sensor T4 defective. (= temperature of discharged air)
A5	Bypass motor malfunction.
A6	n/a
A7	n/a
,Fil' ,tEr'	Display replace filter
E1	Exhaust air fan not working.
E2	Supply air fan not working.
EA2	No communication with enthalpy sensor.



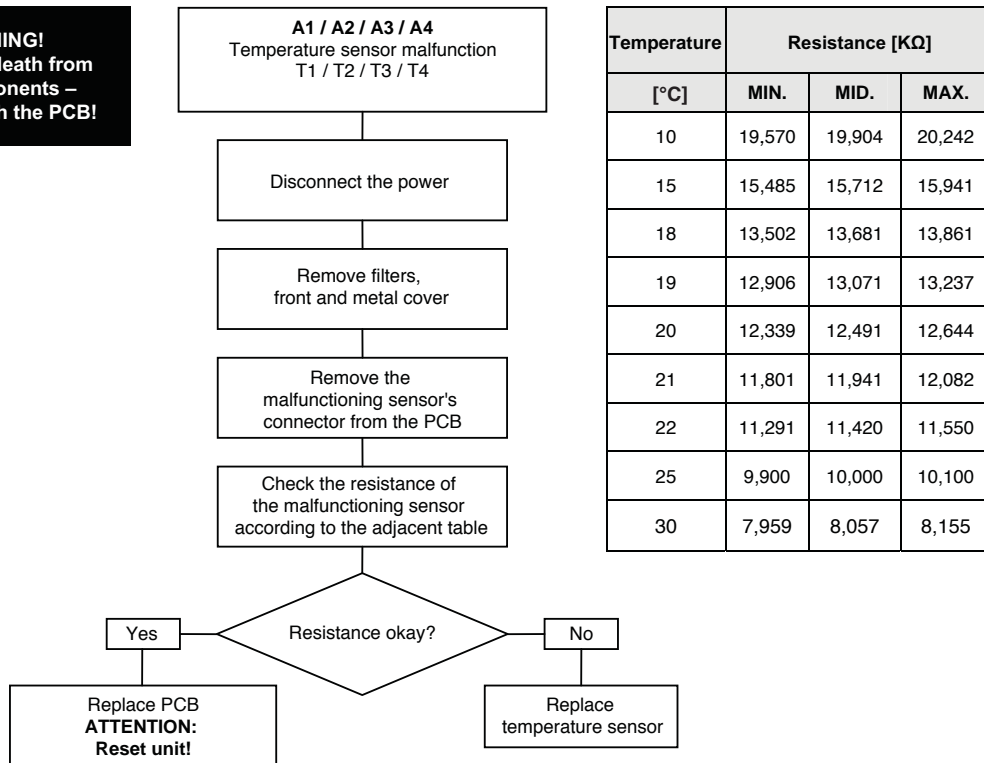
*Ensure that the electrical connections do not come into contact with moisture.*

### 3.10.2 Overview of Malfunctions

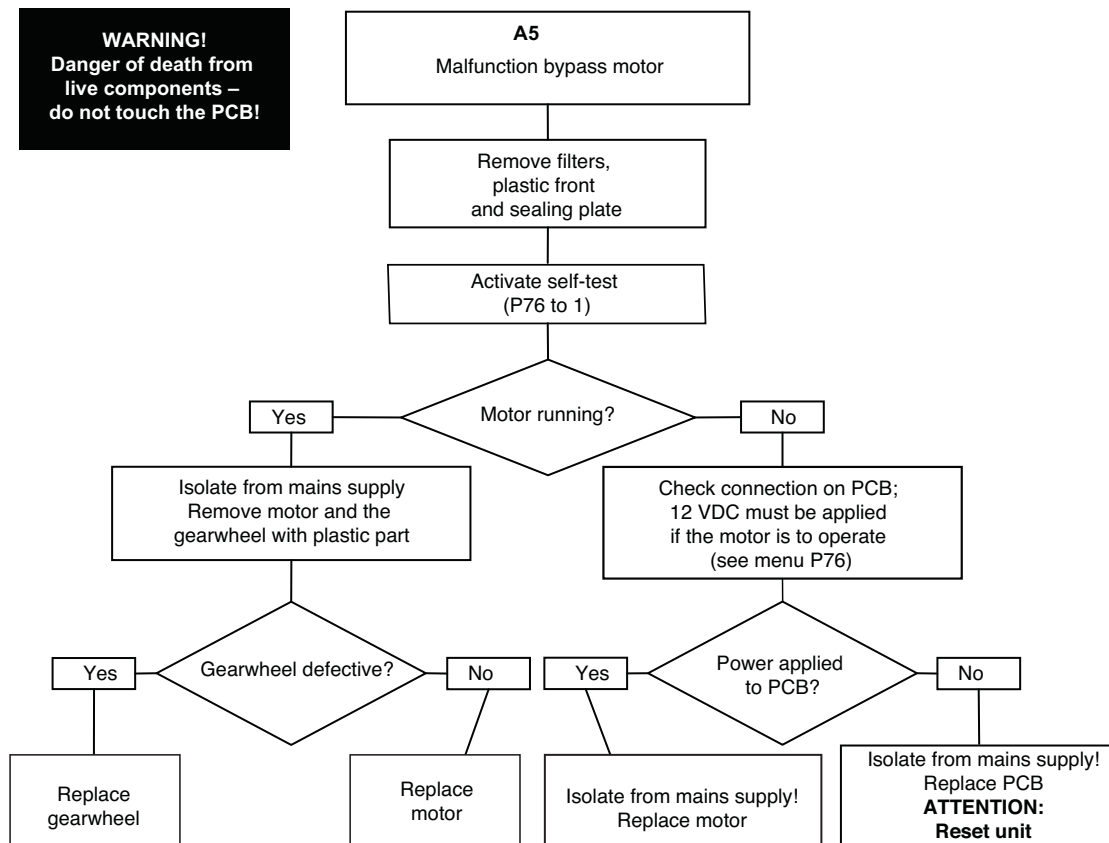
The graphic below offers an overview of the above messages that can be viewed on the display of the control panel in the event of a malfunction.

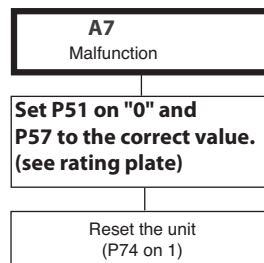
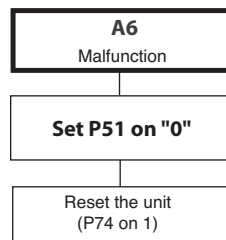
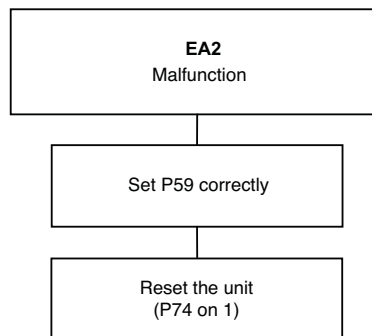


**WARNING!**  
Danger of death from  
live components –  
do not touch the PCB!



**WARNING!**  
Danger of death from  
live components –  
do not touch the PCB!

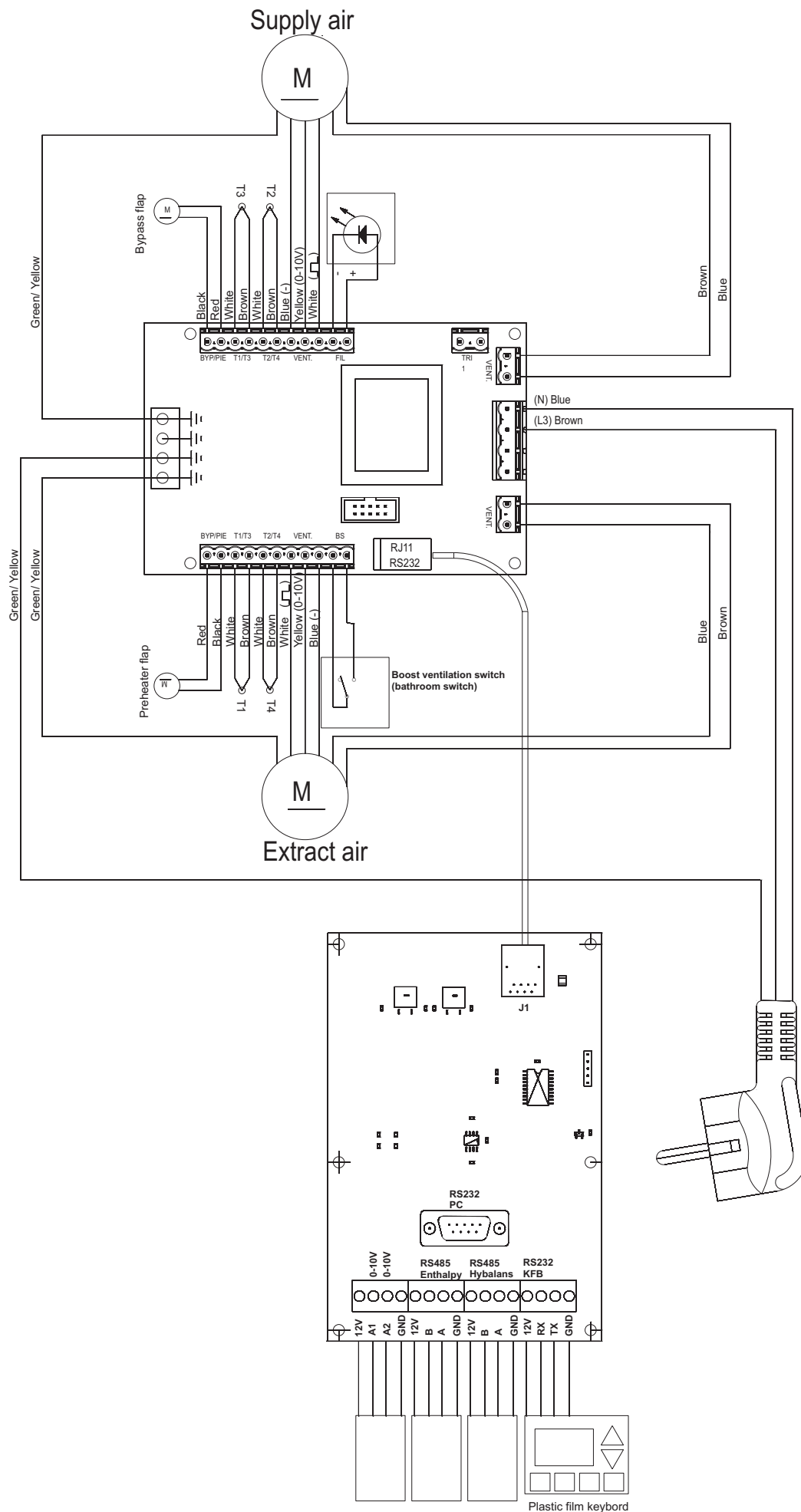




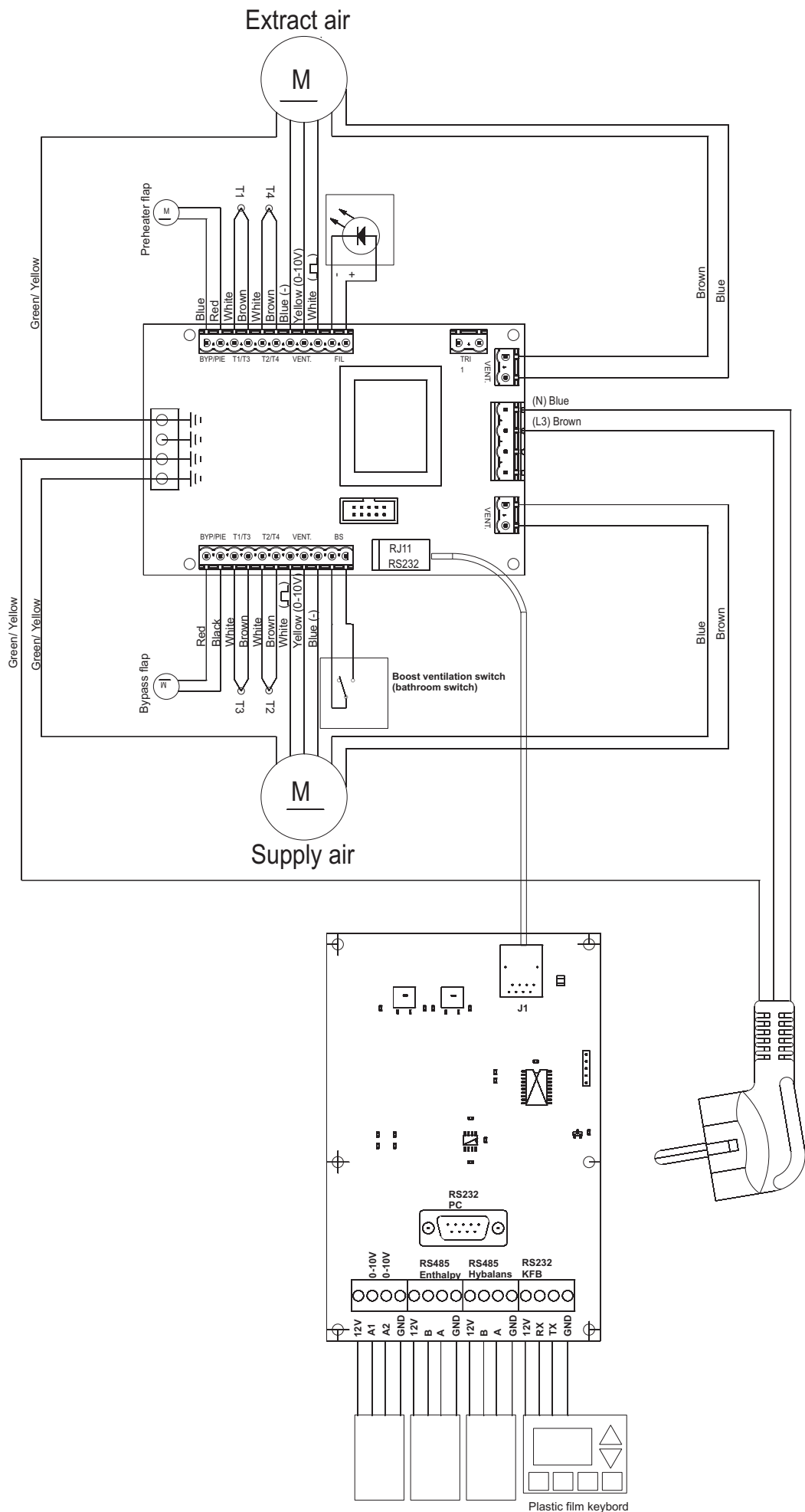
### 3.10.3 Malfunctions (or Problems) not Displayed

This section gives an overview of the malfunctions (or problems) that are not displayed.

Problem / Malfunction	Cause	Check / Remedy
All OFF	Supply voltage	Check the fuse on the controller PCB. • If the fuse is OK the PCB is defective.
	No supply voltage	Mains power supply has failed.
High air delivery temperature in summer	Bypass remains closed	Lower the comfort temperature.
	The Santos is still in winter mode.	Wait until the Santos switches to summer mode.
Low supply air temperature in winter	Bypass remains open	Increase the comfort temperature.
No or too little supply air; shower remains wet	Filter clogged	Replace the filters.
	Valves clogged	Clean the valves.
	Heat exchanger clogged with dirt	Clean the heat exchanger.
	Heat exchanger frozen	Thaw the heat exchanger.
	Fan dirty	Clean the fan.
	Ventilation ducts clogged	Clean the ventilation ducts.
	Santos is set to frost mode	Wait until warm-up phase occurs
Unusual noises	Fan bearings defective	Replace the fan bearings.
	Fan settings	Change the ventilation control settings.
	Scraping noise • Siphon is empty • Siphon does not seal	Install the siphon again.
	Whistling noise • Air leak somewhere in the system	Seal the air leak.
	Air flow noises • Valves do not seal against duct • Valves not open sufficiently	Install the valves again. Reset the valves.
Leaking condensation	Condensation drain clogged	Clean the condensation drain.
	Condensation from the exhaust air duct does not flow into the condensation tray	Check whether the connections are properly joined.
Wired 3-position switch does not function	Wiring not correct	Check the circuit of the 3-position switch by measuring the voltage: • Voltage only between N and L3: [The fans operate at level 1]. • Voltage only between N and L3 and N and L2: [The fans operate at level 2]. • Voltage only between N and L3 and N and L1 or between N and L3, N and L2, N and L1: [The fans operate at level 3].
	Switch is defective	



Appendix 1 Terminal connection plan santos (F) 370 DC left hand side



Appendix 2 Terminal connection plan santos (F) 370 DC right hand side



Date: 14/11/12

We reserve the right to make changes favouring technical progress.

# Technical Data

## Mechanical Ventilation Heat Recovery Unit

### santos (F) 370 DC



#### View:



PASSIV  
HAUS  
geeignete  
KOMPONENTE  
Dr. Wolfgang Feist

santos 370 DC

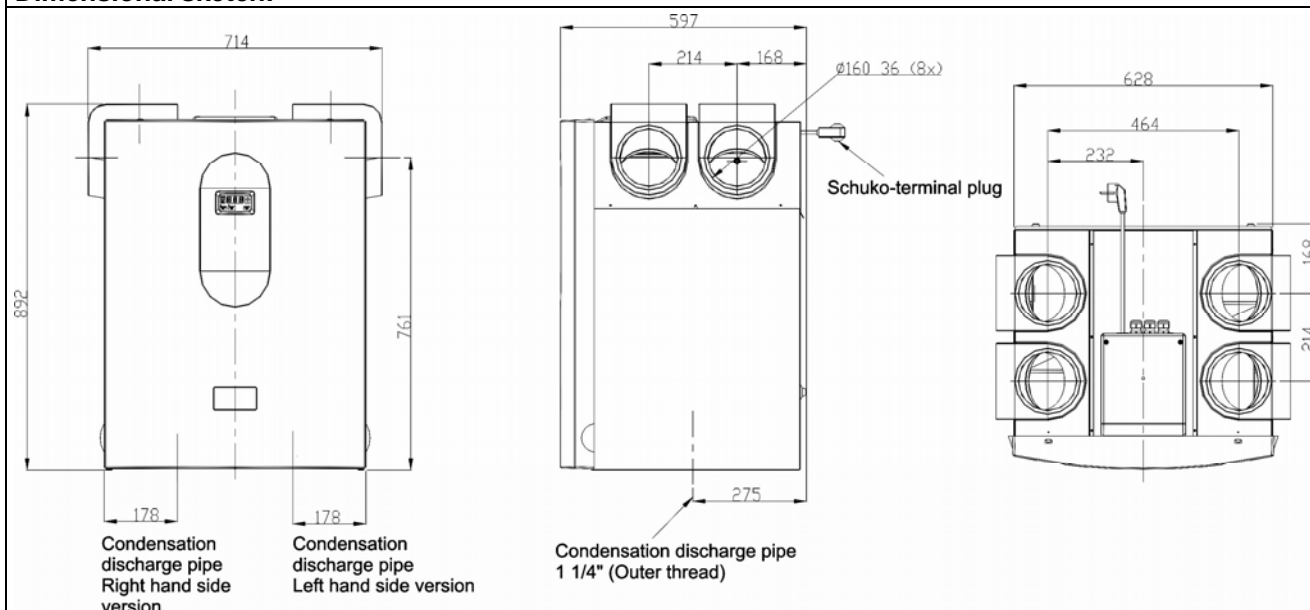
#### Versions:



Right hand side version (Left hand side version)

santos 370 DC - with standard heat exchanger  
santos F 370 DC - with option moisture heat exchanger

#### Dimensional sketch:

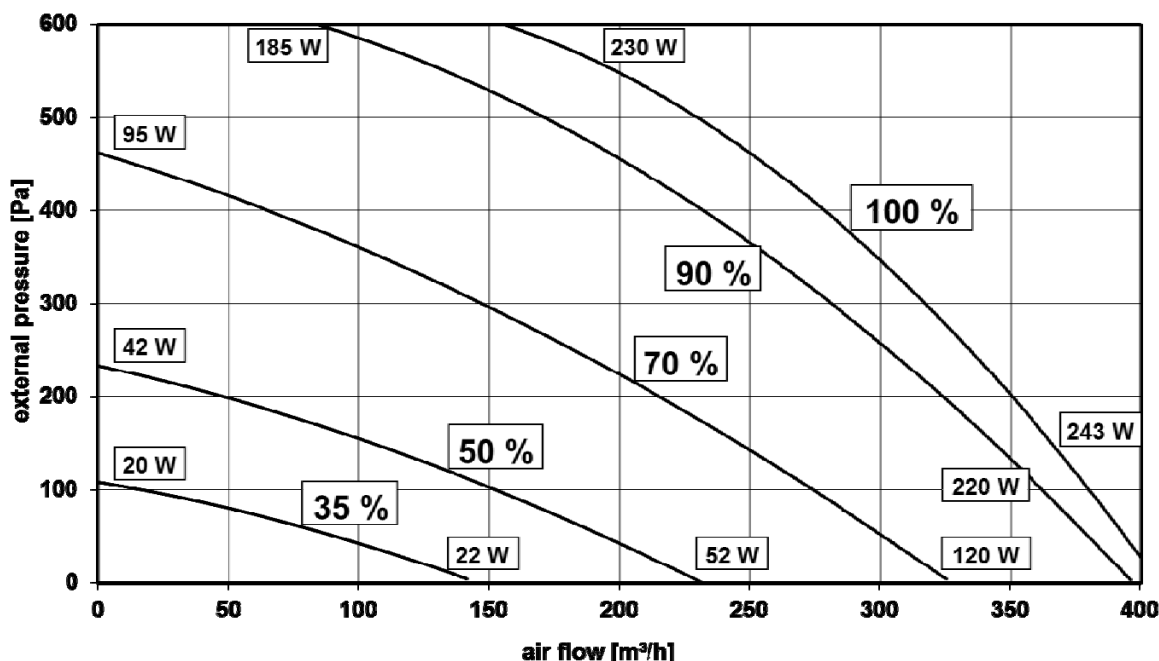


#### Technical Specification:

<b>Heat exchanger:</b>	<b>Material:</b>	<b>Frost limit:*</b>
*depending on outside air and extract air condition	Plastics (standard heat exchanger, PAUL patented – the santos 370)	< 0 °C
	Polymer membrane (enthalpy - the santos F 370)	< -8 °C
<b>Fans:</b>	EC radial fans with integrated electronics	
<b>Filters:</b>	G4 (intake and extract air), Option: pollen filter F7 (intake air)	
<b>Housing:</b>	Galvanised steel sheet, light grey RAL 7035, powder coated, thermal bridge free, inner lining made of expanding polypropylene (E) PP for heat and sound insulation	
<b>Front cover:</b>	Plastic, aquamarine RAL 5021, varnished	
<b>Duct connections:</b>	DN 160, a vertical and/or horizontal connection possibility for every air type	
<b>Condensate drain:</b>	1 1/4" outer thread	
<b>Bypass:</b>	Motorised summer bypass, sensor controlled	
<b>Weight</b>	39 kg	
<b>Electrical connection:</b>	230 Vac, 50 Hz, ready for connection	
<b>Power input:</b>	250 W	
<b>Protection type:</b>	IP 22 (as per DIN 40050)	
<b>Protection class:</b>	I (as per EN 60 335)	
<b>Application limits:</b>	-20 to 50 °C (relates WRG integrated electronic assemblies)	

Installation position:	<ul style="list-style-type: none"><li>• Wall mounted, horizontal (Lower edge at least 235 mm above finished floor level)</li><li>• vertically upright on an adjustable assembly frame (option)</li></ul>		
Operating Data:			
Efficiency criterion:	0,29 Wh/m³ at 233 m³/h, 100 Pa		
Air flow:	40 m³/h to 400 m³/h		
Heat recovery rate:	92,7 % at 150 m³/h (santos 370 DC acc. NEN-EN 308) 84 % at 143 m³/h (santos 370 DC acc. passive house-certificate)		
Heat recovery rate enthalpically:	114 % at 233 m³/h (Enthalpy of the supply air at humidity of the intake air acc. DIN 4719)		
Sound pressure level: as per DIN EN ISO 3743-1 Inspection room parameter: Reverberation chamber 25 m³ Reverberation time 0,5 s Distance 1,5 m	Level		Sound pressure level
	unoccupied level	(20 %, 50 m³/h, 10 Pa)	19 dB(A)
	low level	(35 %, 100 m³/h, 45 Pa)	31 dB(A)
	medium level	(70 %, 225 m³/h, 195 Pa)	52 dB(A)
	high level	(90 %, 275 m³/h, 315 Pa)	58 dB(A)

#### Characteristic curve:



#### Control unit:

- Automatic frost protection
- Comfort temperature regulation
- Filter change announcement (time-based)
- Balance reconciliation between extract air and supply air fan for each level in 1%-steps adjustable
- Connection type for boost ventilation switch (bathroom switch)
- Fault history of the last three error messages
- Simultaneous fireplace operation possible
- Control functions with external 0-10 V input (CO<sub>2</sub>, humidity, air quality)\*
- Time program per week\*
- Separated switching on / off supply air fan and extract air fan \*

\* only with control panel Sealed keypad

#### Control panels:



##### 3-Position-Switch (version Basic)

- 3 fan speeds are possible
- Surface or flush mounted

Cable connection for control:  
YSLY-JZ5x0,5, by the customer




##### Sealed keypad Concealed or wall mounted

- 4 fan speeds are possible
- Operating mode selection: Supply air and extraction air, only supply air, only extraction air
- A free programmable weekday timer
- Additional ventilation regulations (CO<sub>2</sub>, humidity, air quality) adjustable
- Surface or flush mounted

Cable connection for control:  
protected Twisted-Pair-Cable 4x0,34; max. 10 m; by the customer

#### Please note:

- Installation must be in a frost free place, if possible >10 °C.
- The cables for sensors should not be laid out parallel to 230/400 VAC lines (20 cm minimum interval) and should not be laid out in loops.
- There is an additional module for monitoring low pressure for simultaneous operation with fireplaces with a switching off function for the ventilation device and/or exhaust hood with escaping air connection.

<b>Date: 22/08/12</b>  Subject to change in the interest of technical progress.	<h2 style="margin: 0;">Checklist A</h2> <h3 style="margin: 0;">Maintenance by customer</h3>	
---	---	---

<b>Maintenance Work</b>	Enter date in the quarter
-------------------------	---------------------------

1. Change both filters in the MVHR unit (change every 90 days)

Quarter Year	I	II	III	IV
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				

2. Clean extract air prefilter / filter in extract air valves (change approx. every 2 months)

Quarter Year	I	II	III	IV
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				

3. Change prefilter in fresh air line (outdoor air intake - also at ground heat exchanger) – all 6-12 months

Quarter Year	I	II	III	IV
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				
201...				

Simplified formula for determining the local heat recovery rate  $\eta$

$\eta = \frac{t_{Sup} - t_{Int}}{t_{Ext} - t_{Int}}$	Legend: $t_{Int}$ - intake air temperature $t_{Ext}$ - extract air temperature $t_{Sup}$ - supply air temperature	<b>Note:</b> Air temperatures are to be measured in nominal ventilation mode with volume flow balance and sensor arrangement acc. to DIN EN 308!
--	---	---

Date: 23/08/12

Subject to change  
in the interest of technical  
progress.

## Checklist B

### Maintenance by skilled personnel



#### Maintenance


Enter result


- Inspection of MVHR unit acc. to DIN 1946-6 appendix E (normative) and appendix F (informatory)
- Hygiene check acc. to VDI 6022, item 5 and table 6
- Informal report for comments on MVHR unit's condition
- Use additional sheet of paper for adding reports of subsequent years

No.	Components	Action / Interval (in months) <sup>1)</sup>	Result	201...	201...	201...	201...	201...
1	Fan / MVHR unit	Components cleaned? (Heat exchangers, condensate pan, siphon, post heater, unit housing)	6 yes / no					
		Filter test, filter replacement	3 <sup>1)</sup> 3-6 <sup>2)</sup> yes / no					
		Frost protection device functional?	6 yes / no					
		Structure-borne-noise transmission, fixings are avoided?	12 <sup>2)</sup> yes / no					
		Preheater / vaporizer / heat exchanger are not contaminated?	6 yes / no					
		Preheater / vaporizer / heat exchanger are cleaned?	6 yes / no					
		Status indicators are working?	12 <sup>2)</sup> yes / no					
2	Condensate drain and siphon	Working?	3 yes / no					
		Condensate disposal OK?	3 yes / no					
3	Electronic controls	Cable connections and clamp fixing secure?	12 <sup>2)</sup> yes / no					
		Control units working?	12 <sup>2)</sup> yes / no					
4	Air ducts / heat insulation	Inner duct surface tested for contamination	12 yes / no					
		Cleaning done (if required)?	yes / no					
		Heat insulation and vapor barrier OK?	12 <sup>2)</sup> yes / no					
		Flexible connections between MVHR and air ducts OK?	12 <sup>2)</sup> yes / no					
		Air ducts OK?	yes / no					
5	Ground to air heat exchanger (if available)	Changeover working?	12 <sup>2)</sup> yes / no					
		Outdoor air intake free?	12 yes / no					
		Condition of prefilter OK?	12 yes / no					
		Filter changed?	12 <sup>1)</sup> 6 <sup>2)</sup> yes / no					
		Condensate drain OK?	3 yes / no					
		Corrosion OK?	3 yes / no					
6	Fan / MVHR unit and fireplace operating mode (if available)	Safety device with firing installation working?	12 <sup>2)</sup> yes / no					
7	Other filters, filter condition	Filters of correct filter class installed?	12 <sup>2)</sup> yes / no					
		Filter changed?	3-12 <sup>1)</sup> yes / no					
8	Extract air / supply air outlet	Fit and lock OK?	12 <sup>2)</sup> yes / no					
		Filters of correct filter class installed?	12 <sup>2)</sup> yes / no					
		Filter, filter condition OK?	6 <sup>2)</sup> yes / no					
9	Overflow air ducts	Free cross-section?	12 <sup>2)</sup> yes / no					
		No structure-borne / airborne noise transmission?	12 <sup>2)</sup> yes / no					

<sup>1)</sup> Figures: Measure interval in months acc. VDI 6022

<sup>2)</sup> Action / interval in months – indication acc. Paul Wärmerückgewinnung GmbH

<b>Date: 23/08/2012</b>  Subject to change in the interest of technical progress.	<b>Air Flow Report</b> <b>Operating condition, functional check<sup>1)</sup>,</b> <b>instruction</b>				
<b>Customer data</b>					
Surname:	First name:	Tel:			
Street:	ZIP:	Town:			
Construction project:					
MVHR-type:	Serial-No.:	Built:			
<b>Measured data</b>					
Measuring equipment used:	Fault descriptions during measurement:	Indoor temperature <sup>2)</sup>			
		Outdoor temperature <sup>2)</sup>			
		Weather <sup>2)</sup>			
Filter condition on calibration	Supply	Extract air	Building moisture condition: ..... % RH without ventilation mode	Fan speed ratio Extract air / Supply air .....	
clean					
used for approx. ... days					
very dirty					
<b>Supply air</b>				<b>Ventilation step: %</b>	
No.	Room description	Project data		Measured data	
		m³/h	m³/s	m³/h	m³/s
<b>Extract air</b>				<b>Ventilation step: %</b>	
No.	Room description	Project data		Measured data	
		m³/h	m³/s	m³/h	m³/s
Pel =        W (2 fans)					
<sup>1)</sup> The volumetric air flow is measured during normal MVHR operation <sup>3)</sup> as agreed. <sup>2)</sup> acc. to DIN EN 14134, Item 7.3.1.5. <sup>3)</sup> acc. to DIN EN 14134, Item 7.4.1. b) end <sup>4)</sup> acc. to DIN 1946-6 MVHR unit has to run continuously, except for times of maintenance or repair. Use lowest ventilation step or intermittent unoccupied program in times of absence.					
⇒ The user has been instructed on the hygienic requirements <sup>4)</sup> for the operation of the MVHR unit ⇒ Customer has been advised that winter and summer operation influence the interior air humidity If too dry air (<30% RH → in winter) can create a moist heat exchanger transferring remedy - this can be supplied in many PAUL devices. ⇒ No parts other than genuine PAUL parts (e.g. filters) shall be used, otherwise the warranty will be void ⇒ The warranty period starts with delivery ex works					
Date: .....      Signatures: ..... <div style="display: flex; justify-content: space-around;"> <span>Startup personnel / Plumber</span> <span>User</span> </div>					

<b>Date: 23/08/12</b>  Subject to change in the interest of technical progress.	<b>Commissioning and handover certificate</b>  <b>Completeness and performance verifications acc. to DIN 1946-6</b>		

<b>Customer data</b>		
Surname:	First name:	Tel:
Street:	ZIP:	Town:
Construction project:		
MVHR-type:	Serial-No.:	Built:

Completeness			
No.	Device	Ausführung	Result
1	Supply air duct	- Version as planned - Cleaning possible	yes / no yes / no
2	Supply air outlets	- Configuration as planned - Version as planned - Cleaning possible - sufficient distance from the	yes / no yes / no yes / no yes / no
3	Overflow air outlets	- Configuration as planned - Version as planned	yes / no yes / no
4	Extract air outlets	- Configuration as planned - Version as planned - Cleaning possible - Pre-filter provided as planned?	yes / no yes / no yes / no yes / no
5	Extract air duct	- Cleaning possible	yes / no
6	Extract air fan	- Cleaning possible	yes / no
7	Control unit	- working?	yes / no
8	Filters, optional	- Possibility to change - or clean	yes / no
9	Heat exchanger for heat recovery	- Cleaning possible	yes / no
10	Extract air heat pump, optional	- Cleaning possible	yes / no
11	Condensate drain, optional	- working?	yes / no
12	Ground to air heat exchanger, optional	- Cleaning possible	yes / no
13	Duct heater, optional	- Cleaning possible	yes / no
14	Solar panel	- Cleaning possible	yes / no
15	Documentation / manual	- available	yes / no

Function			
1	Ready to use in standard mode (nominal ventilation), as planned	Result OK further steps necessary	yes / no yes / no
2	Different modes possible, as planned	Result OK further steps necessary	yes / no yes / no
3	Power consumption	Result OK further steps necessary	yes / no yes / no

<b>Confirmation</b>	
Date: ..... Signature/Stamp: ..... <div style="text-align: right;">Startup personnel / Plumber</div>	

**Paul Wärmerückgewinnung GmbH**  
**August-Horch-Straße 7**  
**08141 Reinsdorf**  
**Germany**  
**Tel.: +49(0)375 - 303505 - 0**  
**Fax: +49(0)375 - 303505 - 55**



## **CE DECLARATION OF CONFORMITY**

**Product description: Mechanical ventilation heat recovery (MVHR) unit      santos 370 DC - range**

### **Complies the Directives:**

Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC

#### **Applied standards:**

EN 61000-6-1 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments

EN 61000-6-3 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments

EN 55011 Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement

DIRECTIVE 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast)

#### **Applied standards:**

EN ISO 12100-1 Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology

EN ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane

EN ISO 5136 Acoustics - Determination of sound power radiated into a duct by fans and other air-moving devices - In-duct method

DIRECTIVE 2006/42/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

#### **Applied standards:**

EN 60730-1 Automatic electrical controls for household and similar use - Part 1: General requirements

EN 60730-2-15 Automatic electrical controls for household and similar use - Part 2-15: Particular requirements for automatic electrical air flow, water flow and water level sensing controls

**Reinsdorf, 27th of August 2012**  
**Paul Wärmerückgewinnung GmbH**

**Michael Pitsch**  
**CEO**

